

## General

### Title

Diagnostic imaging: percentage of final reports for patients aged 18 years and older who received intravenous iodinated contrast for a CT examination who had an extravasation of contrast.

### Source(s)

American College of Radiology (ACR), American Medical Association-convened Physician Consortium for Performance Improvement® (PCPIA®), National Committee for Quality Assurance (NCQA). Diagnostic imaging performance measurement set. Reston (VA): American College of Radiology (ACR); 2015 Feb. 58 p. [89 references]

## Measure Domain

### Primary Measure Domain

Clinical Quality Measures: Outcome

### Secondary Measure Domain

Does not apply to this measure

## Brief Abstract

### Description

This measure is used to assess the percentage of final reports for patients aged 18 years and older who received intravenous iodinated contrast for a computed tomography (CT) examination who had an extravasation of contrast.

### Rationale

Extravasation of contrast leads to a local inflammatory response that can, in turn, cause acute tissue injury. Patients experiencing extravasation can have symptoms ranging from swelling and burning pain to skin ulceration, tissue necrosis, and compartment syndrome in extreme cases (American College of Radiology [ACR] Committee on Drugs and Contrast Media, 2013).

The following evidence statements are quoted verbatim from the referenced clinical guidelines and other

references:

Extravasated iodinated contrast media are toxic to the surrounding tissues, particularly to the skin, producing an acute local inflammatory response that sometimes peaks in 24 to 48 hours. The acute tissue injury resulting from extravasation of iodinated contrast media is possibly related primarily to the hyper-osmolality of the extravasated fluid. Despite this, the vast majority of patients in whom extravasations occur recover without significant sequelae. Only rarely will a low-osmolality contrast media (LOCM) extravasation injury proceed to a severe adverse event.

Most extravasations are limited to the immediately adjacent soft tissues (typically the skin and subcutaneous tissues). Usually there is no permanent injury.

The most commonly reported severe injuries after extravasation of LOCM are compartment syndromes. A compartment syndrome may be produced as a result of mechanical compression. A compartment syndrome is more likely to occur after extravasation of larger volumes of contrast media; however, it also has been observed after extravasation of relatively small volumes, especially when this occurs in less capacious areas (such as over the ventral or dorsal surfaces of the wrist).

Less commonly, skin ulceration and tissue necrosis can occur as severe manifestations and can be encountered as early as six hours after the extravasation has occurred (ACR Committee on Drugs and Contrast Media, 2013).

All extravasation events and their treatment should be documented in the medical record, especially in the dictated imaging report of the obtained study, and the referring physician should be notified (ACR Committee on Drugs and Contrast Media, 2013).

The reported incidence of intravenous (IV) contrast media extravasation related to power injection for computed tomography (CT) has ranged from 0.1% to 0.9% (1/1,000 patients to 1/106 patients) (ACR Committee on Drugs and Contrast Media, 2013).

## Evidence for Rationale

ACR Committee on Drugs and Contrast Media. ACR manual on contrast media [version 9]. Reston (VA): American College of Radiology; 2013. 128 p.

American College of Radiology (ACR), American Medical Association-convened Physician Consortium for Performance Improvement® (PCPIA®), National Committee for Quality Assurance (NCQA). Diagnostic imaging performance measurement set. Reston (VA): American College of Radiology (ACR); 2015 Feb. 58 p. [89 references]

## Primary Health Components

Intravenous iodinated contrast; computed tomography (CT); extravasation

## Denominator Description

All final reports for patients aged 18 years and older who received intravenous iodinated contrast for a computed tomography (CT) examination

## Numerator Description

Final reports for patients aged 18 years and older who had an extravasation of contrast (see the related "Numerator Inclusions/Exclusions" field)

# Evidence Supporting the Measure

## Type of Evidence Supporting the Criterion of Quality for the Measure

A clinical practice guideline or other peer-reviewed synthesis of the clinical research evidence

A formal consensus procedure, involving experts in relevant clinical, methodological, public health and organizational sciences

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

## Additional Information Supporting Need for the Measure

### Importance of Topic

As imaging technology continues to advance, the United States healthcare system has seen an increase in both the type and frequency of imaging studies being performed. The increase in utilization of imaging studies is accompanied by a corresponding increase in cost and exposure to radiation for both patients and healthcare professionals.

From 1980 to 2006, the number of radiologic procedures performed in the United States showed a ten-fold increase while the annual per-capita effective dose from radiologic and nuclear medicine procedures increased by 600% (Mettler et al., 2009).

From 1996 to 2010, the number of computerized tomographic (CT) examinations tripled, while the number of ultrasounds nearly doubled (Smith-Bindman et al., 2012).

From 1996 to 2010, advanced diagnostic imaging (i.e., CT, magnetic resonance imaging [MRI], nuclear medicine, and ultrasound) accounted for approximately 35% of all imaging studies (Smith-Bindman et al., 2012).

From 1980 to 2006, the proportion of radiation exposure that is attributable to medical sources increased from 17% to 53% (Mettler et al., 2009).

In 2006, while CT scans only accounted for approximately 17% of all radiologic procedures performed in the United States, they accounted for over 65% of the total effective radiation dose from radiologic procedures (Mettler et al., 2009).

In 2006, the estimated per-capita effective radiation dose for radiologic procedures in the United States was nearly 20% higher than the average for other well-developed countries (Mettler et al., 2009).

Diagnostic imaging was prioritized as a topic area for measure development due to a high level of utilization, rising costs, and the need for measures to help promote appropriate use of imaging and improve outcomes.

### Opportunity for Improvement

Extravasation is a relatively common occurrence that affects 1 out of 147 patients who are given intravenous contrast (Wang et al., 2007). Elderly patients and small children, as well as patients with limited communication abilities, severe illness or debilitation, or abnormal circulation, are at increased risk for extravasation (American College of Radiology [ACR] Committee on Drugs and Contrast Media, 2013).

## Evidence for Additional Information Supporting Need for the Measure

ACR Committee on Drugs and Contrast Media. ACR manual on contrast media [version 9]. Reston (VA): American College of Radiology; 2013. 128 p.

American College of Radiology (ACR), American Medical Association-convened Physician Consortium for Performance Improvement® (PCPI®), National Committee for Quality Assurance (NCQA). Diagnostic imaging performance measurement set. Reston (VA): American College of Radiology (ACR); 2015 Feb. 58 p. [89 references]

Mettler FA, Bhargavan M, Faulkner K, Gilley DB, Gray JE, Ibbott GS, Lipoti JA, Mahesh M, McCrohan JL, Stabin MG, Thomadsen BR, Yoshizumi TT. Radiologic and nuclear medicine studies in the United States and worldwide: frequency, radiation dose, and comparison with other radiation sources--1950-2007. *Radiology*. 2009 Nov;253(2):520-31. [PubMed](#)

Smith-Bindman R, Miglioretti DL, Johnson E, Lee C, Feigelson HS, Flynn M, Greenlee RT, Kruger RL, Hornbrook MC, Roblin D, Solberg LI, Vanneman N, Weinmann S, Williams AE. Use of diagnostic imaging studies and associated radiation exposure for patients enrolled in large integrated health care systems, 1996-2010. *JAMA*. 2012 Jun 13;307(22):2400-9. [PubMed](#)

Wang CL, Cohan RH, Ellis JH, Adusumilli S, Dunnick NR. Frequency, management, and outcome of extravasation of nonionic iodinated contrast medium in 69,657 intravenous injections. *Radiology*. 2007 Apr;243(1):80-7. [PubMed](#)

## Extent of Measure Testing

Some of the measures in this set are being made available without any prior testing. The Physician Consortium for Performance Improvement (PCPI) recognizes the importance of testing all of its measures and encourages testing of the diagnostic imaging measurement set for feasibility and reliability by organizations or individuals positioned to do so. The *Measure Testing Protocol for PCPI Measures* was approved by the PCPI in 2010 and is available on the PCPI Web site (see Position Papers at [www.physicianconsortium.org](http://www.physicianconsortium.org) ); interested parties are encouraged to review this document and to contact PCPI staff. The PCPI will welcome any opportunity to promote the initial testing of these measures and to ensure that any results available from testing are used to refine the measures before implementation.

## Evidence for Extent of Measure Testing

American College of Radiology (ACR), American Medical Association-convened Physician Consortium for Performance Improvement® (PCPI®), National Committee for Quality Assurance (NCQA). Diagnostic imaging performance measurement set. Reston (VA): American College of Radiology (ACR); 2015 Feb. 58 p. [89 references]

## State of Use of the Measure

### State of Use

Current routine use

### Current Use

not defined yet

## Application of the Measure in its Current Use

## Measurement Setting

Ambulatory/Office-based Care

Ambulatory Procedure/Imaging Center

Hospital Inpatient

Hospital Outpatient

Long-term Care Facilities - Other

Skilled Nursing Facilities/Nursing Homes

## Professionals Involved in Delivery of Health Services

not defined yet

## Least Aggregated Level of Services Delivery Addressed

Single Health Care Delivery or Public Health Organizations

## Statement of Acceptable Minimum Sample Size

Does not apply to this measure

## Target Population Age

Age greater than or equal to 18 years

## Target Population Gender

Either male or female

## National Strategy for Quality Improvement in Health Care

### National Quality Strategy Aim

Better Care

### National Quality Strategy Priority

Making Care Safer

Prevention and Treatment of Leading Causes of Mortality

## Institute of Medicine (IOM) National Health Care Quality Report Categories

## IOM Care Need

Getting Better

## IOM Domain

Effectiveness

Safety

## Data Collection for the Measure

### Case Finding Period

Unspecified

### Denominator Sampling Frame

Patients associated with provider

### Denominator (Index) Event or Characteristic

Diagnostic Evaluation

Patient/Individual (Consumer) Characteristic

### Denominator Time Window

not defined yet

### Denominator Inclusions/Exclusions

Inclusions

All final reports for patients aged 18 years and older who received intravenous iodinated contrast for a computed tomography (CT) examination

Exclusions

Unspecified

Exceptions

None

### Exclusions/Exceptions

not defined yet

### Numerator Inclusions/Exclusions

Inclusions

Final reports for patients aged 18 years and older who had an extravasation\* of contrast

*\*Extravasation:* Although most patients complain of initial swelling or tightness, and/or stinging or burning pain at the site of extravasation, some experience little or no discomfort. On physical examination, the extravasation site may be edematous, erythematous, and tender.

Exclusions

Unspecified

## Numerator Search Strategy

Fixed time period or point in time

## Data Source

Electronic health/medical record

Imaging data

Paper medical record

Registry data

## Type of Health State

Adverse Health State

## Instruments Used and/or Associated with the Measure

Unspecified

## Computation of the Measure

### Measure Specifies Disaggregation

Does not apply to this measure

### Scoring

Rate/Proportion

### Interpretation of Score

Desired value is a lower score

### Allowance for Patient or Population Factors

not defined yet

### Standard of Comparison

not defined yet

# Identifying Information

## Original Title

Measure #10: extravasation of contrast following contrast-enhanced computed tomography (CT).

## Measure Collection Name

Diagnostic Imaging Performance Measurement Set

## Submitter

American College of Radiology - Medical Specialty Society

## Developer

American College of Radiology - Medical Specialty Society

National Committee for Quality Assurance - Health Care Accreditation Organization

Physician Consortium for Performance Improvement® - Clinical Specialty Collaboration

## Funding Source(s)

Unspecified

## Composition of the Group that Developed the Measure

Diagnostic Imaging Measure Development Work Group Members

William Golden, MD (*Co-chair*) (internal medicine)  
David Seidenwurm (*Co-chair*) (diagnostic radiology)  
Michael Bettmann, MD  
Dorothy Bulas, MD (pediatric radiology)  
Rubin I. Cohen, MD, FACP, FCCP, FCCM  
Richard T. Griffey, MD, MPH (emergency medicine)  
Eric J. Hohenwarter, MD (vascular interventional radiology)  
Deborah Levine, MD, FACP (radiology/ultrasound)  
Mark Morasch, MD (vascular surgery)  
Paul Nagy, MD, PhD (radiology)  
Mark R. Needham, MD, MBA (family medicine)  
Hoang D. Nguyen (diagnostic radiology/payer representative)  
Charles J. Prestigiacomo, MD, FACS (neurosurgery)  
William G. Preston, MD, FAAN (neurology)  
Robert Pyatt, Jr., MD (diagnostic radiology)  
Robert Rosenberg, MD (diagnostic radiology)  
David A. Rubin, MD (diagnostic radiology)  
B Winfred (B.W.) Ruffner, MD, FACP (medical oncology)  
Frank Rybicki, MD, PhD, FAHA (diagnostic radiology)  
Cheryl A. Sadow, MD (radiology)  
John Schneider, MD, PhD (internal medicine)



Gary Schultz, DC, DACR (chiropractic)  
Paul R. Sierzenski, MD, RDMS (emergency medicine)  
Michael Wasylik, MD (orthopedic surgery)

Diagnostic Imaging Measure Development Work Group Staff

*American College of Radiology:* Judy Burleson, MHSA; Alicia Blakey, MS

*American Medical Association-convened Physician Consortium for Performance Improvement:* Mark Antman, DDS, MBA; Kathleen Blake, MD, MPH; Kendra Hanley, MS; Toni Kaye, MPH; Marjorie Rallins, DPM; Kimberly Smuk, RHIA; Samantha Tierney, MPH; Stavros Tsipas, MA

*National Committee for Quality Assurance:* Mary Barton, MD

## Financial Disclosures/Other Potential Conflicts of Interest

None of the members of the Diagnostic Imaging Work Group had any disqualifying material interest under the Physician Consortium for Performance Improvement (PCPI) Conflict of Interest Policy.

## Adaptation

This measure was not adapted from another source.

## Date of Most Current Version in NQMC

2015 Feb

## Measure Maintenance

This measure is reviewed and updated every 3 years.

## Date of Next Anticipated Revision

2018

## Measure Status

This is the current release of the measure.

## Measure Availability

Source available from the [American College of Radiology \(ACR\) Web site](#) .

For more information, contact ACR at 1891 Preston White Drive, Reston, VA 20191; Phone: 703-648-8900; E-mail: [info@acr.org](mailto:info@acr.org); Web site: [www.acr.org](http://www.acr.org) .

## NQMC Status

This NQMC summary was completed by ECRI Institute on October 13, 2015. The information was verified by the measure developer on November 19, 2015.

# Copyright Statement

This NQMC summary is based on the original measure, which is subject to the measure developer's copyright restrictions.

©2014 American Medical Association (AMA) and American College of Radiology (ACR). All Rights Reserved. CPT® Copyright 2004 to 2013 American Medical Association.

## Production

### Source(s)

American College of Radiology (ACR), American Medical Association-convened Physician Consortium for Performance Improvement® (PCPIA®), National Committee for Quality Assurance (NCQA). Diagnostic imaging performance measurement set. Reston (VA): American College of Radiology (ACR); 2015 Feb. 58 p. [89 references]

## Disclaimer

### NQMC Disclaimer

The National Quality Measures Clearinghouse® (NQMC) does not develop, produce, approve, or endorse the measures represented on this site.

All measures summarized by NQMC and hosted on our site are produced under the auspices of medical specialty societies, relevant professional associations, public and private organizations, other government agencies, health care organizations or plans, individuals, and similar entities.

Measures represented on the NQMC Web site are submitted by measure developers, and are screened solely to determine that they meet the [NQMC Inclusion Criteria](#).

NQMC, AHRQ, and its contractor ECRI Institute make no warranties concerning the content or its reliability and/or validity of the quality measures and related materials represented on this site. Moreover, the views and opinions of developers or authors of measures represented on this site do not necessarily state or reflect those of NQMC, AHRQ, or its contractor, ECRI Institute, and inclusion or hosting of measures in NQMC may not be used for advertising or commercial endorsement purposes.

Readers with questions regarding measure content are directed to contact the measure developer.